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| **Stair Step Patterns**  \*Lesson is adapted from activities in *ThinkMath!,* Harcourt School Publishers, 2008. |
| **Mathematics, Grade 2** |
| **Materials:**   * Stair Step Cards – Blackline Master is attached to lesson; print on cardstock or stiff paper; 1 page of cards per student * Square pieces of paper, any size – 1 per student * Scissors – 1 pair of scissors per student * Color Tiles and Circular Counters (50 of each per student or pair of students)- , OR 1-inch grid paper (1 piece per student) – (see Explanation) |
| **TEKS/SEs:**   * 2.6C – identify, describe, and extend repeating and additive patterns to make predictions and solve problems * 2.7C – cut two-dimensional geometric figures apart and identify the new geometric figures formed - (Elaboration)   **Objective 6 TEKS/SEs (Underlying Processes and Mathematical Tools):**   * 2.12A – identify the mathematics in everyday situations * 2.12B – solve problems that incorporate understanding the problem, making a plan, carrying out the plan, and evaluating the solution for reasonableness * 2.12D – use tools such as real objects, manipulatives, and technology to solve problems * 2.13A – explain and record observations using objects, words, pictures, numbers, and technology * 2.13B – relate informal language to mathematical language and symbols * 2.14 – use logical reasoning; justify thinking using objects, words, pictures, numbers, and technology |
| **Lesson objective(s):**   * + Students will :     - Identify a growing pattern and make predictions based on that pattern |
| **Differentiation strategies to meet diverse learner needs:**   * Problem- solving, inquiry-approach * Hands-on exploration * Collaboration and discussion |
| **ENGAGEMENT:**   * Give each student a copy of the Stair Step Cards and have them cut out the cards, or pre-cut the cards for them. Cut along the outside border lines so that each card has two straight sides and the stair steps. * Introduce the cutouts as “Stair Step Cards” and allow students time to explore the cards.   + *How are the cards the same? Different?*   + *How many rows are on each card? How many columns?*   + *Why do you think these are called Stair Step Cards?* |
| **EXPLORATION**  **Part 1**:   * Position the cards on the board to show one step, two steps up, and three steps up. * Draw a line to represent the floor below the stairs since counting steps without a representation of the floor may confuse students.   1 step, 1 dot 2 steps, 3 dots 3 steps, 6 dots   * Have children follow along using their own Stair Step Cards. As you position each card, have children get used to the idea that there are two different things to count: the *number of steps* and the *number of dots*.   + *How many steps are on each card? How many dots?*   + *What patterns do you see?*   + *What do you think the next Stair Step Card would look like?* * Guide students to add the next card with four rows and do the same as above, and the card with five rows. |
| **EXPLANATION**   * Students will explain their thinking and justify their solutions in groups and in whole-class discussion, as well as with drawings, diagrams, and oral explanations. * Ask students to use color tiles and circular counters, or drawings on 1-inch grid paper, or circular counters on 1-inch grid paper, to create the next two Stair Step Cards in the pattern. |
| **ELABORATION**   * Give each student a square piece of paper, and have them fold it in half on the diagonal. Cut the fold. Discuss how this creates two triangles within the square. Hold up a few Stair Step Cards and point out the triangular shape of the cards. Compare the paper triangles with the shape of each Stair Step Card (also makes a kind of triangular shape if you look at the dots on the diagonal). * Have students use their Stair Step Cards to experiment with combining two cards into a square. Have them try different combinations of cards to find as many squares as they can. * Ask for volunteers to show their examples and explain their thinking.   + *How do you know your shape is a square?*   + *Which cards fit together to form a square?*   + *How many different squares can you make with two cards?* |
| **EVALUATION**   * Observe students:   + *Do they understand that each column is one box taller than the column to its left?*   + *Do they see a pattern of one more column each time as they move from one Stair Step Card to the next one in the pattern?*   + *Do they see a pattern of one more row each time as they move from one Stair Step Card to the next? 4, then 5, then 6?* |